

Beowulf Database Architecture

Strawman design 1

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Design Criterion

- Operational
 - Ingest new/updated files without undue interruption
 - Large data staging area (2 Tb?)
 - Quick data transfers between nodes
 - Concurrent searching

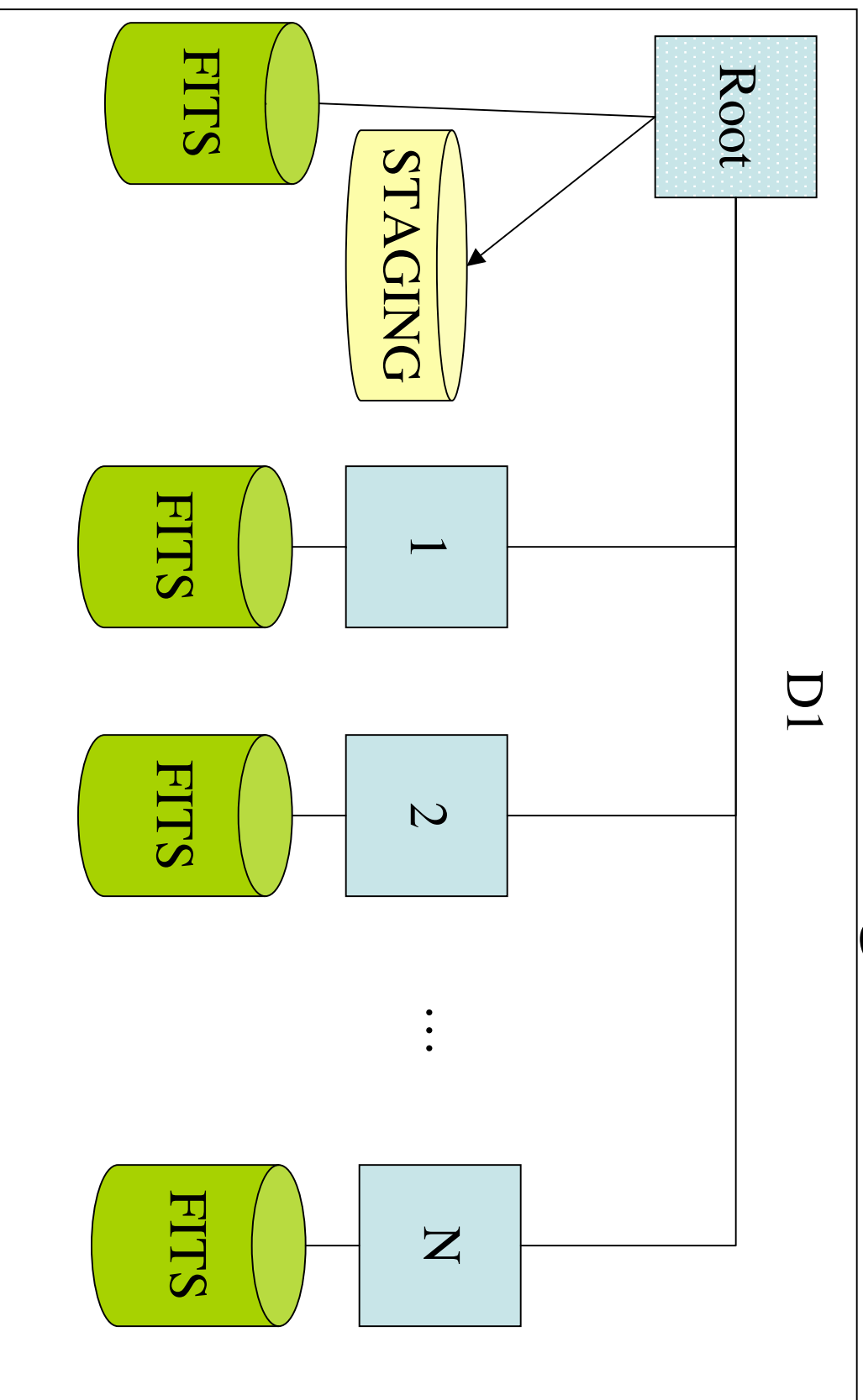
Design Criteria 2

- Reliability
 - Handle node failures (crashes)
 - Handle disk failures
 - Automatic verification of data file versions
 - Handle main (root) server failures without too much interruption

Design Criteria 3

- External communication
 - Want cluster to handle queries only from a single host (not required, but I like the cleanness of this choice)
 - 1 Beowulf server to be middleman between outside world (web interface, ftp service, and ingest from LIOC pipeline)
 - Want logging of queries and results outside of Beowulf. (easier for Sys admins to maintain).

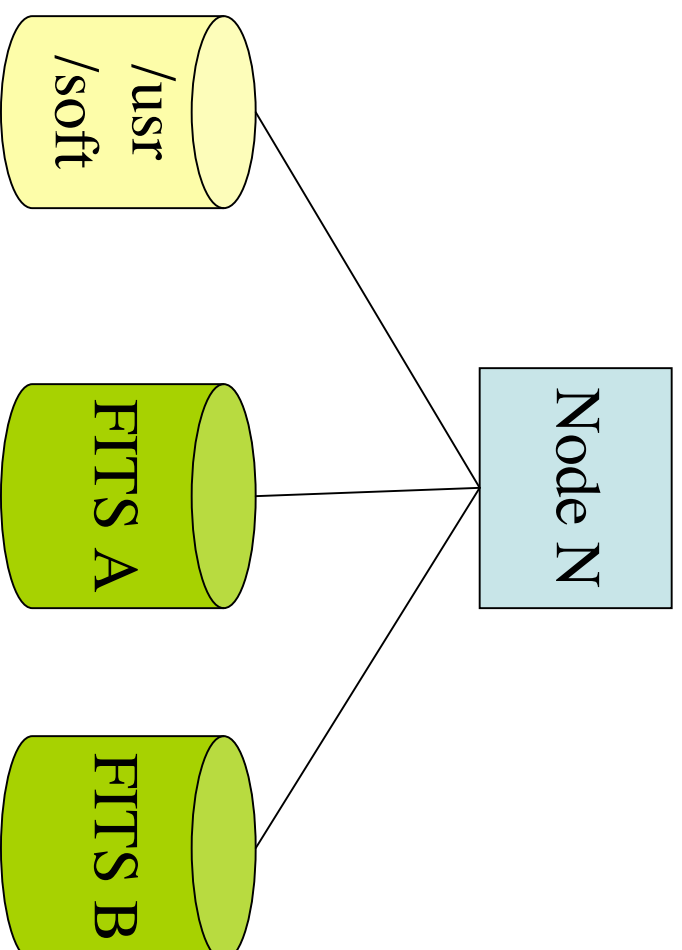
Cluster design



Cluster design notes

- Disks
 - **FITS** Disks on nodes contain all FITS files with all photons and are mirrored on the node. I.e., 2 (~200Gb) disks are locally mounted on each node. If one disk fails the other one can then be used immediately. (this allows automated switchover, but is this needed?)
 - Staging disk(s) is(are) mounted by root node(s) and an external node that is ftp accessible.
 - A third disk would contain the operating system and software

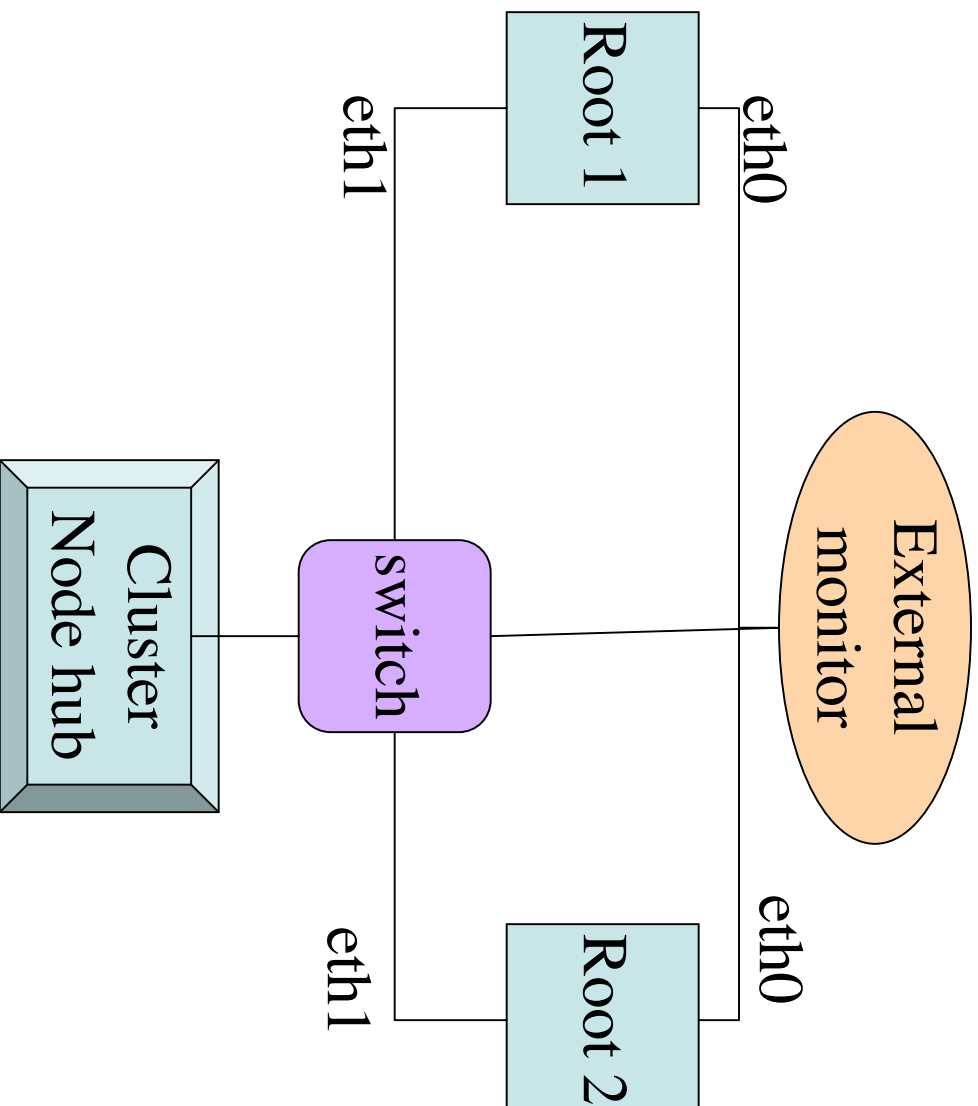
Disk Mounts



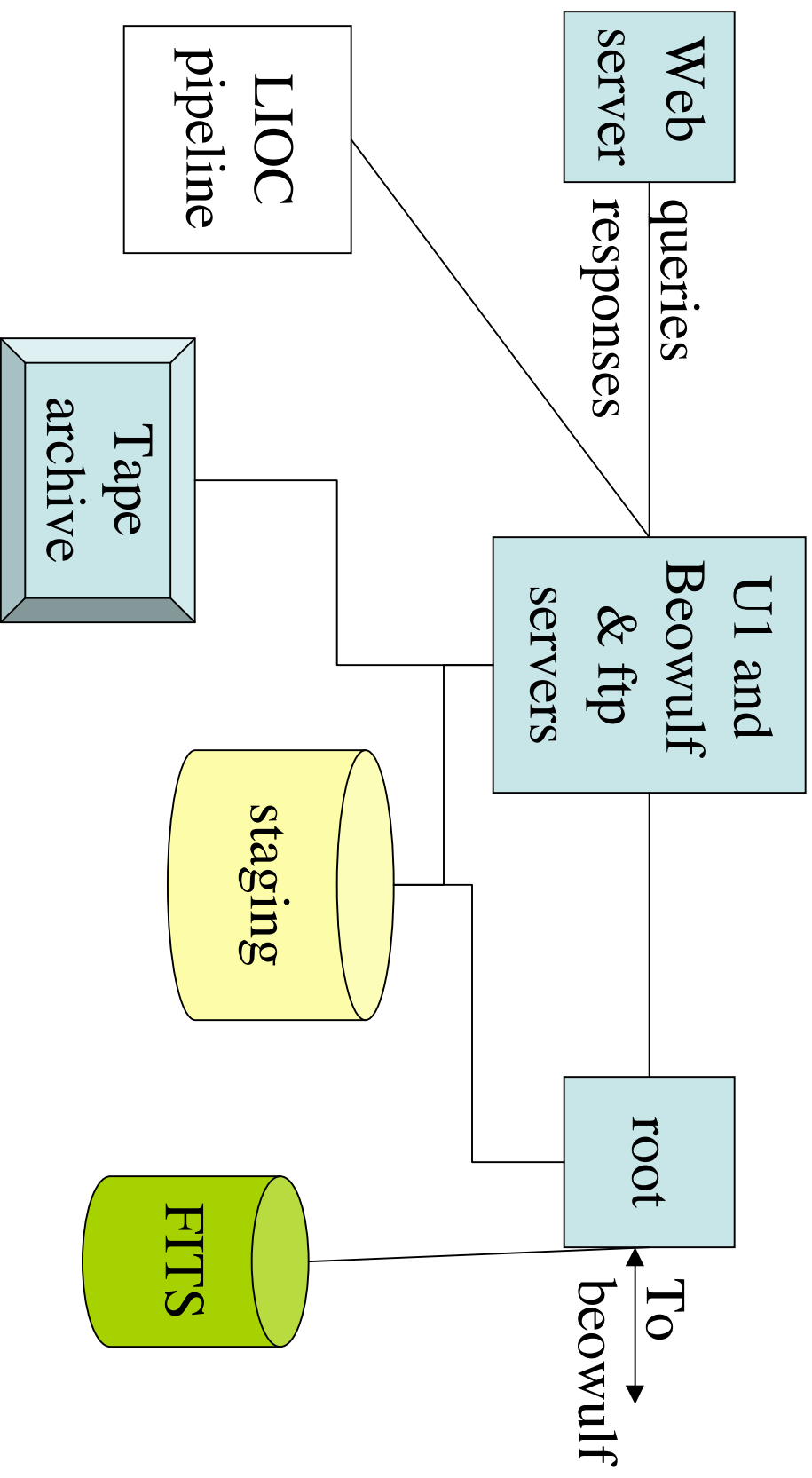
Cluster Design notes 2

- Nodes
 - Each node has 3 disks drivers (SCSI?)
 - Root node has 2 ethernet cards: 1 to talk to outside and 1 on beowulf net. All other nodes have 1 ethernet card.
 - Root node is mirrored (copy is switched out of the network until needed). Not sure how to do this.
 - The number of Nodes N will be determined by the perceived performance needs by the SSC and LAT.

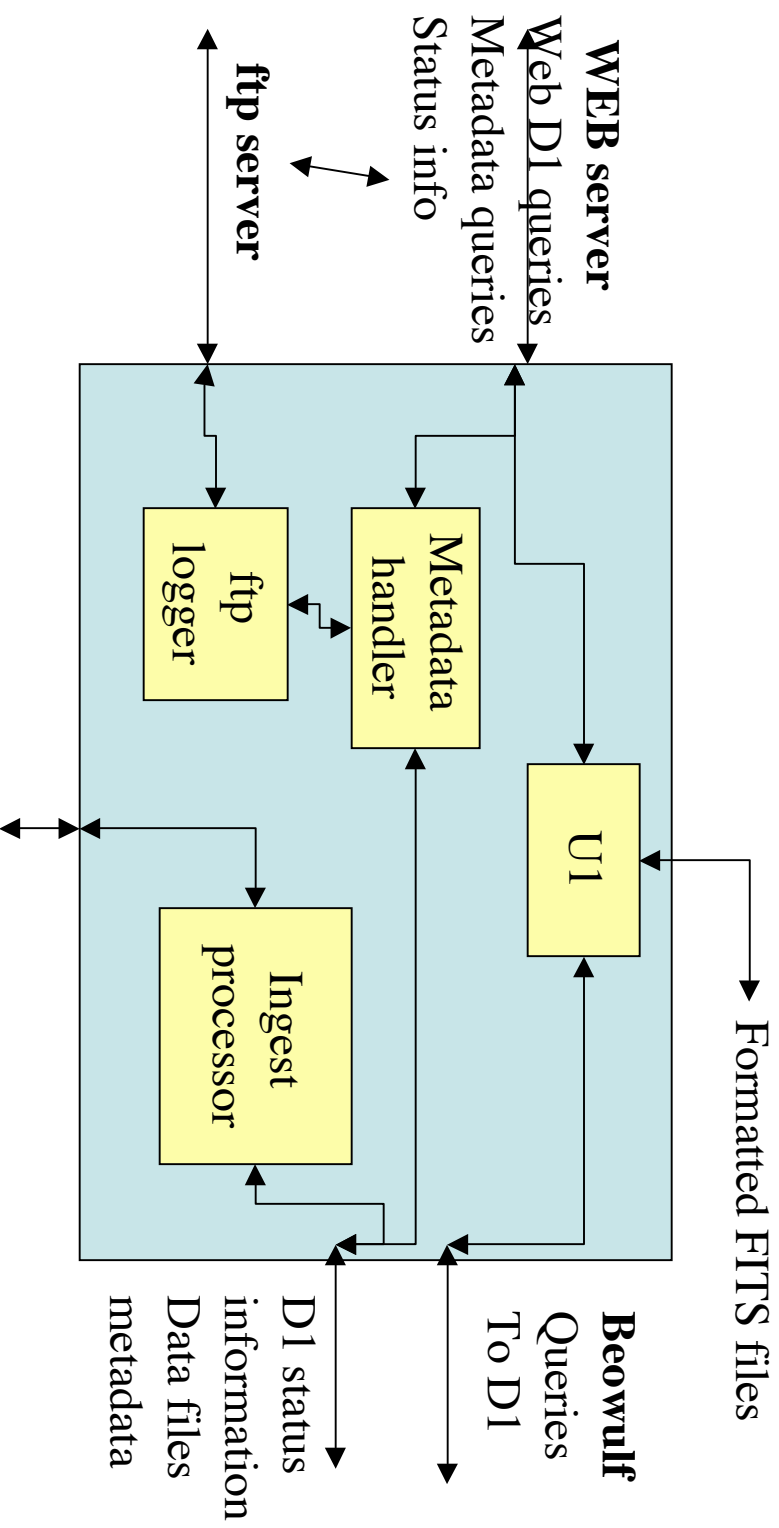
Root Node mirroring



External Connections



Interfaces



LIOC Pipeline ingest

Cluster Processes

- Ingest Pipeline (1st 3 steps on Beowulf server)
 - LIOC pipeline produces new/reprocessed FITS file.
 - Filter Program reads file defining photons, then creates new FITS file with only photons.
 - FITS file verification+checksum generated.
 - New photon FITS file sent to root node
 - New file copied to all nodes
 - FITS index file with filenames, time spans, checksums and file sizes updated. Index file copied to all nodes.
 - Beowulf search server process (on root) told to re-read index file.

Database agents

- Each node has a process which periodically checks FITS index file against disk contents. (file sizes, names and checksums)
- Assuming LIOC delivers only entire FITS files when reprocessing
- Each node checks disk operational status
- Root node checks state of slave nodes (and itself).

External communication

- External Request Queue
 - Requests put on to-do list until completed and logged. (light database?)
 - Beowulf server has a db which tracks requests (request criteria, searcher id, query status, query completion status, query result ftp status.)
 - Beowulf root sends out query status (queued, processing, complete + path to results)

External Communication 2

- Ingest communication
 - New data file notification to ROOT
 - File transfer status to Beowulf server
- Error messages (out of Root node)
 - Processing failures
 - Hardware failures.

Staging Disk contents

- FITS files resulting from queries in separate subdirectories.
- FITS files ready for ingest (+ checksum and file size information)
- Log files for Beowulf search engine.